New structural and petrological data for the Susa Shear Zone (mid-Susa Valley, Western Alps): Constraints on a polyphasic shear zone between eclogite and blueschist units

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In the Western Alps, nappes of different paleographic origin are stacked in the orogenic wedge. Subduction- and exhumation-related units are juxtaposed and have recorded different metamorphic peaks at different stages of the orogenic evolution (e.g. Dal Piaz et al., 2003). This study focuses on the tectonic and metamorphic evolution of the mid-Susa Valley (Inner Western Alps) where the tectonic contact between the Eclogite belt and the Frontal wedge is well exposed (Malusà et al., 2011). The Eclogitic belt consists of a meta-ophiolite unit (Internal Piedmont Zone, IPZ) which was coupled early in the tectono-metamorphic evolution with a continental margin unit (Dora Maira Massif, DM), while the Frontal wedge corresponds to blueschist-facies meta-ophiolitic units (External Piedmont Zone, EPZ). The IPZ is a remnant of the Mesozoic Alpine Tethys, and consists of meta-ophiolites with a thin metasedimentary cover (Balestro et al., 2015, and reference therein), whereas the DM corresponds to a composite Paleozoic basement covered by a siliciclastic and carbonate successions. EPZ consists of minor meta-ophiolites and a thick oceanic metasedimentary cover (i.e., the Schistes Lustrès; Tricart and Schwartz, 2006, and reference therein). The Susa Shear zone is the tectonic contact between the Eclogitic belt and Frontal wedge and is a first order structure (Gasco et al., 2011) which underwent a polyphasic evolution with development of two mylonitic foliations (Sm1 & Sm2), related to an early HP event and a late LP event respectively. The SSZ also shows a composite kinematic evolution, characterized by top to East and top to West shear sense during the Sm1 and Sm2 development, respectively. The white mica grains that define the mylonitic foliation are chemically zoned and record a gap in pressure between the first and the second event. Sm1 is mostly marked by phengite (Si apfu=3.5 – 3.65), while Sm2 is characterized by muscovite (Si apfu= 3.2 – 3.45). The first mylonitic event, syn-to-post kinematic respect to regional foliation (S2), juxtaposed (early coupling) units recording two previous tectonic regional events, and developed at different times and under different geodynamic regimes in each unit. The coupled units were successively affected by further deformation during uplift. Finally, the SSZ was reactivated during a later extensional deformation phase (second mylonitic event) defined by discrete extensional crenulation clevage (ECC). This study focused on detailed geological mapping, which provided novel structural information on the SSZ. Furthermore, the combination of microstructural and petrological data with geochronological data will allow a new reconstruction of the complete kinematic and tectono-metamorphic evolution of the boundary between eclogite and blueschist units.

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